April 1968
Vol. 33, No. 9

WATER RESOURCE PLANNING

Watershed protection
Geology of damsites

soil conservation

DEVOTED TO THE WISE USE OF LAND AND WATER RESOURCES

Soil Conservation Service

U. S. Department of Agriculture

April 1968 Vol. 33, No. 9

soil conservation

DEVOTED TO THE WISE USE OF LAND AND WATER RESOURCES

COVER: A floodwater-retarding structure in the Poteau River Watershed Project takes form as a self-loading scraper makes its round in a cloud of dust.

Results . . .

What does a river basin survey do for a community?

We have been hearing of SCS participation in these broad resource studies under Public Law 566 for 10 years or more. Some are coming to an end now, and a few of the reports are completed.

To see what the product is like and how it is used, we asked the River Basins people for a report on one of the completed surveys.

River Basin Conservationist Sheldon Boone's lead article (p. 195) reviews the character and content of the formal report on the Poteau River Basin in Oklahoma and Arkansas.

Information Specialist Claude Crowley visited towns in the basin to get the story of the local people involved and the impact of the study on community planning and action (p. 197).

State action: A State, too, can take the initiative in planning a total water-resource program through studies of its river basins. New York State Conservationist "Wally" Anderson joins with Commissioner Francis W. Montanari to tell (p. 199) how New York has organized to cover its entire area.

New type: A new printer brings us a new selection of typefaces for this issue. We hope the change gives our official magazine a more modern look in keeping with our advancing programs.

Soil Conservation is printed by a private concern under annual contract with the GPO.

195 The Poteau River Basin survey
By Sheldon G. Boone

197 Pioneering the Poteau

199 New York plans for water
By Francis W. Montanari and Wallace L. Anderson

201 Mennonites put stewardship to work to halt floods

203 Drainage improvements extend a playground

204 Geologic studies help assure safe watershed structures
By Gunnar Brune

206 Watershed project keeps town safe from hurricane floodwaters

208 Strip mine makes a recreation area

212 Meetings
National Council of State Garden Clubs

213 Review
Selected Papers in Soil Formation and Classification; The Wild Gardener in the Wild Landscape; Man—An Endangered Species?; Agricultural Development and Economic Growth; New publications; Soil surveys

215 From the Administrator
Planning for Water and Related Resources

Conservation locally and abroad
207 Conversion to golf course, Massachusetts; 209 Television soil stewardship, Illinois; 210 Tropical soils study, Puerto Rico; 211 Conservation pioneers, Paraguay; 212 Pastureland, South Carolina; 216 Diversions and tillage, Idaho

SOIL CONSERVATION is the official magazine of the Soil Conservation Service, published monthly by direction of the Secretary of Agriculture as administrative information required for proper transaction of the public business. The printing of the publication was approved by the Bureau of the Budget July 25, 1963.

ORVILLE L. FREEMAN, Secretary of Agriculture
JOHN A. BAKER, Assistant Secretary of Agriculture
DONALD A. WILLIAMS, Administrator, Soil Conservation Service
BEN O. OSBORN, Editor
GEORGIE A. KELLER, Production Editor

Prepared in the Division of Information, Soil Conservation Service, U. S. Department of Agriculture, Washington, D. C. 20250

Reprint permission: Contents of this magazine may be reprinted without special permission. Credit is not required but is appreciated. Photos available on request.
Commercial names: Mention of commercial enterprises or brand names does not constitute endorsement or imply preference by the Department of Agriculture.

Subscription: $2.00 per year, $2.75 foreign. Single copy 20 cents. Discount of 25 percent on orders of 100 or more sent to same address. Order direct from Superintendent of Documents, Government Printing Office, Washington, D. C. 20402.

It's comprehensive

It's cooperative

The Poteau River Basin Survey

By Sheldon G. Boone

Assistant director, River Basins Division, SCS

A comprehensive analysis of water and related land resources and the needs and potentials for their development give people of the Poteau River Basin of Oklahoma and Arkansas firm guidelines for future projects in the area.

About a year ago, the Soil Conservation Service delivered the formal report to the Poteau River Watershed Council of Soil and Water Conservation Districts. The survey was conducted in response to the request of the council, which for some 15 years has led efforts to deal with water problems in the basin.

The report was the product of 5 years of work in cooperation with the U.S. Army Corps of Engineers, other agencies of the Department of Agriculture, and State and local agencies concerned with water conservation and development. It recommends five major developments for the immediate future:

With the assistance of the Department of Agriculture—

(1) Soil conservation treatment of 346,000 acres of land, at an estimated cost of $11.5 million. This treatment would involve 49,000 acres of cropland, 155,000 acres of pasture and range, 113,000 acres of forest and woodland, and 47,000 acres of wildlife, recreation, and nonagricultural land.

(2) Installation of watershed protection and flood-prevention projects (Public Law 566) on all tributary watersheds where such programs are feasible. In addition to the Poteau River and Fourche Maline Creek watersheds, already authorized when the survey started, five other upstream watersheds were found to be potentially feasible projects: Caston-Mountain Creek, Black Fork Creek, Combined Creek, James Fork Creek, and Brazil Creek. The total cost of the structural measures in these five watersheds is estimated at $11.8 million. The proposed projects include 41 structure sites for flood prevention, some of which have potential for multiple-purpose storage.

By the Army Corps of Engineers—

(3) Modification of the Wister Reservoir to include 118,000 acre-feet of additional storage, primarily for water supply, water-quality control, and recreation at an estimated cost of $1.6 million.

(4) Construction of a reservoir on Brazil Creek for flood control, water supply, and recreation at an estimated cost of $13 million.

(5) Improvement of the Poteau River channel below the Wister Reservoir at a cost of $9.5 million.

The investigation was one of 20 such studies undertaken by the Soil Conservation Service in cooperation with another Federal or State water agency under provisions of the Watershed Protection and Flood Prevention Act. Such cooperative comprehensive studies

are known as "type IV" studies in the program of basin-wide investigations that now involve more than 75 percent of the land area of the 48 mainland States (see *Soil Conservation*, December 1966).

The Poteau River Basin studies were initiated by the Army Corps of Engineers in response to resolutions of the Congress authorizing it to make investigations of improvements for flood control and allied purposes and for navigation.

As a result of early hearings, the Corps recognized the desire of local people for watershed improvements under Public Law 566 with assistance from the Soil Conservation Service. The Corps and SCS agreed that plans for water-resource development in the basin should be comprehensive and should be coordinated among the agencies involved.

At the start of the study in 1962, some progress in water and related land-resource development had already taken place. The Corps had constructed the Wister Reservoir at a cost of about $10.5 million. The Fourche Maline Creek Watershed Project (Public Law 566), estimated to cost $6 million, was under construction. Soon thereafter the Poteau River Watershed Project, at $5.4 million, was approved.

Upon request of the Poteau River Watershed Council, the Department of Agriculture undertook the study to: (1) Consider the present and projected needs for erosion control, flood prevention, water management, fish and wildlife, and recreation; (2) evaluate the capabilities and potentials of meeting the water and related land-resource needs; and (3) to coordinate studies with those being made by the Army Corps of Engineers.

The Soil Conservation Service has leadership responsibility for USDA participation in river basin investigations. The Economic Research Service and Forest Service participate jointly and other USDA agencies—especially Farmers Home Administration and Rural Electrification Administration—make contributions when their interests are involved. The Poteau River study was carried out by a field advisory committee consisting of representatives of the Soil Conservation Service, Economic Research Service, and Forest Service, with SCS as chairman.

The Economic Research Service and the Forest Service evaluated the needs for water-resource development in relation to agricultural crops and forest resources. The Soil Conservation Service and the Forest Service determined the need for land treatment and management practices.

The Army Corps of Engineers determined needs for water supply to meet municipal and industrial requirements and, with assistance from the Public Health Service, for water-quality control.

Data on streamflow, recreation needs, and fish and wildlife values were obtained from the Department of the Interior. The SCS and Corps shared the responsibility for determining the magnitude of the flooding problems. Generally SCS determined flood damages in upstream watershed areas and the Corps in downstream and urban areas. The Corps made studies on the need and opportunity for navigation.

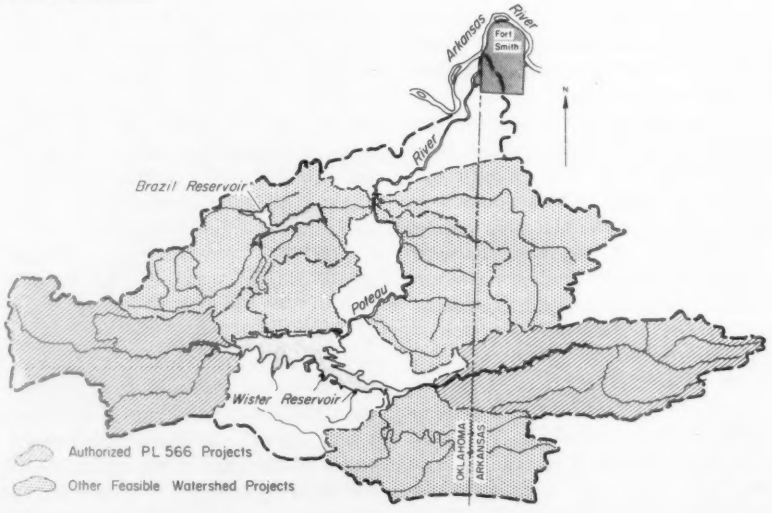
Findings of needs for development were coordinated with appropriate State and local organizations, and potentially feasible projects were identified jointly among the agencies.

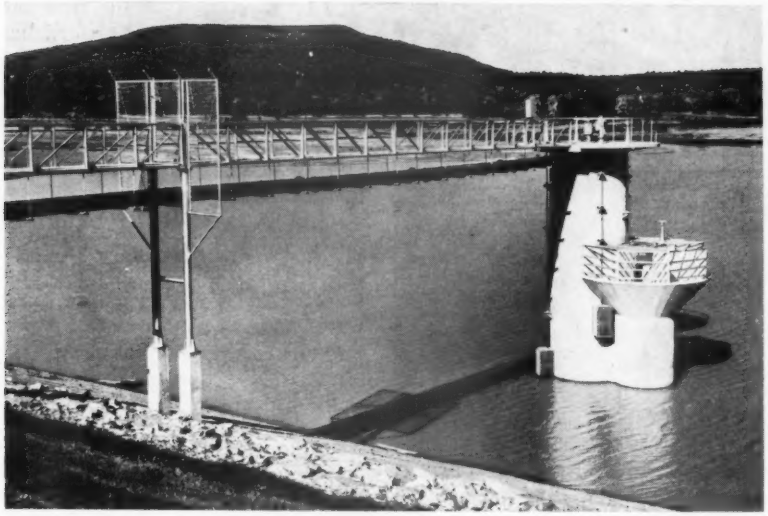
SCS with the assistance of the Forest Service studied each of the upstream watersheds to determine what potential existed for Public Law 566 projects to help meet the needs and to consider possible developments by other agencies. These studies identified projects that would be needed during the next 10 to 15 years.

Of eight upstream watersheds studied, five were determined to be potentially feasible as Public Law 566 projects, and the other three contained measures that could be developed by other means. The Corps studied the opportunities for project development on the main stem and larger tributaries.

The coordinated report shows only what water developments are needed and feasible. The securing of approval for watershed work plans and authorization of flood-control projects are still ahead. The council and the other responsible State and local organizations still have plenty to do to make their dreams become a reality. ♦

Poteau River Basin.





This multipurpose reservoir in the Poteau River Watershed Project brought a crucial water supply to Waldron, Ark., in time to rescue the town's major industry. The picture shows the inlet tower and spillway.

Pioneering the Poteau

Members of the Poteau River Watershed Council would never describe themselves as pioneers, but that is exactly what they are.

They organized a river basin council when Public Law 566 was still a dream. They had no guidelines, no treasury, and no authority, but they made it work. The council brought into focus many of the goals of 44,000 people living in western Arkansas and eastern Oklahoma.

A new confidence

Their coordinated approach to conservation problems has already heartened the economy and promises a vigorous resource development program in the near future. Multiple-purpose dams are already supplying water to industries and homes in two thirsty communities. Floods have been reduced on three operational watersheds, and residents of the rural communities have a new confidence in their area.

"The main thing that inspired us to organize back in 1953 was flooding," Council President John E. Evans said. Evans, a rancher, and pastor of a 50-member Baptist Church near Waldron, Ark., has headed the council throughout its 15-year life.

Evans' ranch home was isolated by high water three or four times a year. Landowners along the creek frequently lost livestock in the fast-rising floodwaters. Sediment from steep mountainous areas with insufficient cover, and from burned-over pastures and woodlands, filled channels and covered more fertile land. In parts of the flood plain, good soil was lost by scour erosion.

"John Kopf, one of our local soil conservation district supervisors, conceived the idea of a council for the entire basin," Evans said. "At one of our regular board meetings, John proposed that we get together with other Poteau basin soil conservation districts to do something about upstream floods."

Districts of two States

A map shows the 1,888-square-mile Poteau Basin hanging from its mouth on the Arkansas River in the form of a rough triangle. The stateline divides it with about one-third in Arkansas and two-thirds in Oklahoma. The largest town, Poteau, is located near the geographic center of the basin.

The triangle is made up of scenic mountain country reminiscent of the Blue Ridge range of the East. The mountains, some of them reaching to more than 2,000 feet elevation, slope down into scenic, narrow valleys. Expanses of forest cover about 70 percent of the basin. Most of the cropland is on the main stem and tributary flood plains.

Arrangements were made to meet with the other four soil conservation districts in the basin on July 28, 1953. The Poteau River Watershed Council was born that day.

The council is made up of supervisors from the Poteau River and the Sebastian County soil and water conservation districts in Arkansas and the LeFlore County, Haskell County, and Latimer County districts in Oklahoma.

Dr Lloyd E. Church at Wilburton was elected vice president of the council, and Terry Chaffin of Poteau was elected secretary and

The down-to-earth annual meetings of the Poteau River Watershed Council help keep up the enthusiasm of the 15-year-old organization.

treasurer. Church, a well known conservationist-dentist, had recently moved to the community, bringing with him several years' experience as a soil conservation district supervisor and dedicated booster of the Washita River Watershed Flood Prevention Program.

Chaffin, a retired teacher who operates a 420-acre livestock farm, has been chairman of the LeFlore Soil and Water Conservation District for two decades.

Then Public Law 566

The Poteau River Watershed Council was elated with the passage of Public Law 566, only a year after the council's organization.

By 1961, two key watersheds were authorized for operations with Public Law 566 assistance. Under the urging of the Poteau Council, watershed projects were hatching out on the streams above Wister Lake, which the U.S. Army Corps of Engineers had built on the main stem in 1948. But, in spite of the progress made, there was still no coordinated plan or source of information. The council kept working with the Corps and the Department of Agriculture to obtain an overall study of the basin.

In 1962 the study was set in motion. The State conservationist of Oklahoma was designated as chairman of a field advisory committee to direct and review the work of USDA agencies and to coordinate with the Army Corps of Engineers. The Forest Service and Economic Research Service each appointed a member to the committee. Geologists, engineers, and economists were soon consulting with the council and the various watershed sponsors about ways to protect and develop the basin's resources.

A report was completed by the cooperating agencies in 1966. The study revealed that average annual flood, erosion, and flood-plain scour damages and nonfarm damages add up to more than $1.3 million. Feasible structural measures suggested by the study will reduce annual damages by an estimated 83 percent. Land-treatment measures will further reduce the figure by an estimated 4 to 5 percent.

Members of the Poteau River Watershed Council realize that the big job is still ahead, but accomplishments have shown them the value of their pioneering organization.

Three watershed projects, representing a sizable portion of the Poteau drainage area, were authorized for operation by the time the survey was underway. A third has been authorized recently.

Multipurpose reservoirs

The towns of Waldron, Ark., and Wilburton, Okla., are already getting their municipal water from watershed lakes. Other multiple-purpose watershed reservoirs under construction will provide fish and wildlife benefits, recreation, and water storage for future use.

Waldron's major industry, employing 375 people, was so short of water the management considered moving. The reservoir brought ample water—750,000 gallons a day—to the industry and assured that the jobs and $20,000 a week payroll would stay.

Wilburton had to put strict controls on water use in dry periods. Fire was a frightening thought when the town tank was nearly dry and little water was coming in. With the new reservoir the town has plenty of water, and several miles of rural lines have been developed to serve out-of-town subscribers.

Dr. Church takes visitors to Wilburton to the 95-acre multiple-purpose reservoir being built in Robber's Cave State Park. The Oklahoma Planning and Resources Board and the Oklahoma Wildlife Conservation Department are sharing the cost of the structure, which they say will be an outstanding feature of the popular family park.

If the measures recommended by the coordinated study are carried out, such accomplishments will be but a minor portion of the benefits enjoyed by the people of the basin.

With plenty of high-quality water, freedom from flood and related damage, and a location strategic to trade centers and transportation, almost unequaled for beautiful mountain scenery, the Watershed Council envisions a period of unprecedented growth for the Poteau Basin. ♦

New York plans for water

Regional resource development boards bring agencies together in studies of river basins

By Francis W. Montanari and Wallace L. Anderson

Assistant commissioner for water resources, New York State Conservation Department, Albany, and State conservationist, SCS, Syracuse, N.Y.

New Yorkers, pressed by the drought years of 1962–66, are taking a searching look at their river basins and organizing forces to plan the development of their extensive water resources.

In 1959, the Temporary State Commission on Water Resources Planning reported, "The most productive approach to the State's water-resource problems can be accomplished through State-Federal cooperation. . . ." Now, Federal and State agencies are cooperating on river basin studies covering almost the entire State.

The State Water Resources Commission represents State interests by including members from State Departments of Conservation, Transportation, Agriculture and Markets, Health, Commerce, Law, and the Office for Local Government. The Division of Water Resources is the commission's technical service arm in river basin studies.

The U.S. Department of Agriculture participates in river basin studies through the Soil Conservation Service with the cooperation of the Economic Research Service, Forest Service, and other agencies as appropriate.

Studies in progress

Two studies, one on the Genesee River Basin and one on the Susquehanna River Basin, will result in recommendations for the construction of water-resource projects. Also underway are a North Atlantic Regional Study and an Ohio River Basin Study, which will result in framework plans for these two streams.

A Western New York River Basins Study, now in the beginning stage, will identify specific projects in its recommendations. Under a cooperative agreement with the Soil Conservation Service, the New York State Division of Water Resources will reimburse SCS $44,000 in order to accelerate the studies to meet schedules for a completed comprehensive water-resource plan established by the division. The money will be used to make upstream reservoir site inventories and cost estimates and to do field surveys of flood and drainage problems.

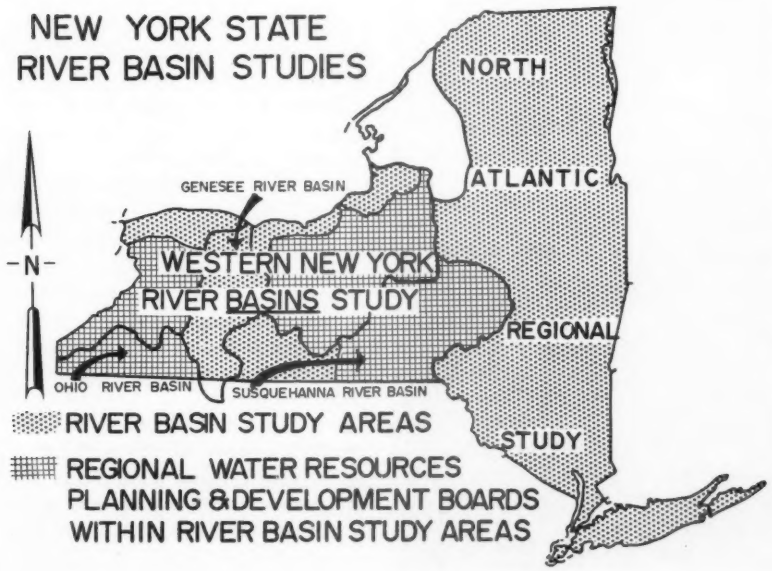
Other studies are being conducted jointly by interstate or Federal-State commissions or committees in the Delaware River Basin, the Great Lakes Basin, the New England River Basins, and as part of the Appalachian Regional Development Program.

Role of conservation districts

The State recognizes the importance of soil and water conservation districts as a means of including local people in resource planning. In turn, the districts encourage county governments to request the State Water Resources Commission to form regional water-resources planning and development boards. Six such boards, representing 24 of the 62 counties in the State, have been organized since 1960.

A regional water-resources planning and development board formulates a comprehensive plan which identifies projects economically justified for development and outlines possible means of financing and managing them. The board uses basin studies as a guide for applying plans suggested by the U.S. Army Corps of Engineers and the U.S. Department of Agriculture.

The Board's personnel and its



Channel improvement projects (right) are recommended in river basin reports for flood control, drainage, and streambank stabilization.

legal, engineering, and other services come from the commission, through the Division of Water Resources of the State Conservation Department. The counties involved pay 25 percent of the cost of the study, and the State pays the balance.

A variety of interests

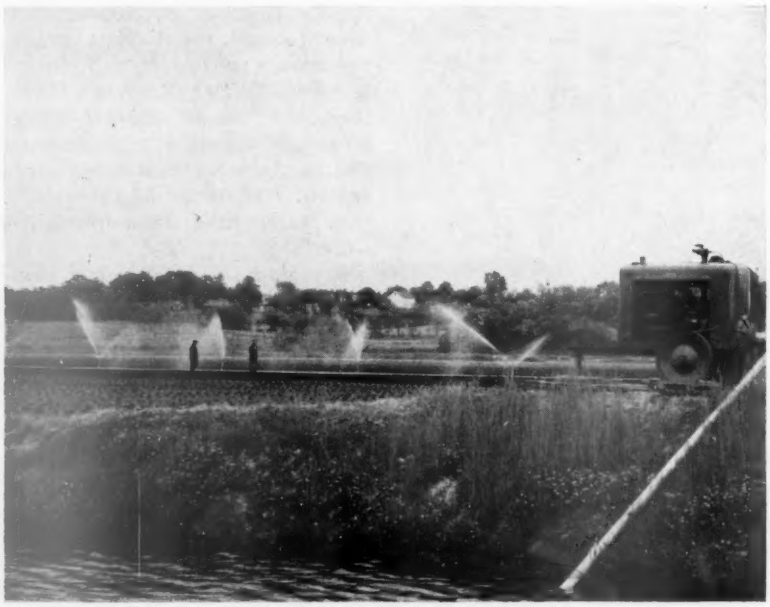
Five of the seven board members represent a specific interest, such as agriculture, industry, public water supply, municipal corporations, and outdoor recreation, and two are members-at-large.

For example, on the Erie-Niagara Basin Board in western New York, agriculture is represented by Wendell Call, a town supervisor and vice-chairman of the Genesee County Soil and Water Conservation District. Many dedicated men, like Mr. Call, are investing much time and energy toward insuring wise use of the State's water resources.

Soil and water conservation districts and regional water-resource planning and development boards complement each other. Districts give information and support to the boards and help insure the proper consideration of agricultural interests in the final plans. As an example, seven districts in the South Central Resource Conservation and Development Project recently helped supply the petition for establishing the Eastern Susquehanna Regional Planning Board. This board is now established.

Local governments and State and Federal agencies are anxious to convert these plans to action. The result will be construction of reservoirs for flood control, municipal water supply, pollution control, irrigation, and recreation; the identification of areas best suited for agriculture, highways, and parks; the enlargement or stabilization of channels for flood control, navigation, drainage, or sediment reduction; and the proper use and management of land to reduce erosion and floods and to insure proper use of land resources. The plan also will point out the needs for new State and possibly Federal legislation for action programs.

Although anxious for action programs to begin, New Yorkers are convinced that adequate and proper planning is necessary to ensure the most economical and wise use of each dollar spent. ♦



Comprehensive river basin plans (left) also appraise present and future irrigation needs. Irrigation projects can then be planned to meet these needs.

Mennonites put stewardship to work to halt floods in Kansas watershed

The moment of truth—it came suddenly to the congregation of the Tabor Mennonite Church—a congregation of families with deep roots in the soil of the Newton, Kans., countryside. Christian soil stewardship, as they had been practicing it, was based more on feelings than on facts.

The facts were that their land, a rich heritage from 19th century immigrant farmers, was showing the strain of modern farming pressures. Soil that had provided food, feed, and fiber for three generations of Mennonites was leaving the fields with each heavy summer storm. Erosion scars were appearing on knolls and steeper slopes. And love for the land, though ingrained and sincere, wasn't enough to prevent widespread destruction.

The moment of truth for most of the menfolk of the Tabor Parish came during a meeting held at the church on the night of January 10, 1966—the outgrowth of a disastrous flood that hit the town of Newton on June 9, 1965.

The Newton flood

The meeting was arranged by the Rev. James Waltner and officials of the church following a discussion with Marvin Hostetler, Kansas State chairman of the Mennonite Disaster Service. But the truth, in stark clarity, came out several months earlier while the flood-plagued town of Newton was fighting its way out of the avalanche of water, mud, and debris dumped upon it from surrounding rain soaked farms.

All of Harvey County had been experiencing rainy weather jitters for more than a week. Sand Creek was reported higher than during a 1960 flood that caused widespread damage.

Then, on June 9, came the flood that Newton residents will never forget. Residential sections were inundated. Waters surged into basements and living rooms. Refugees made their way out of isolated buildings on foot or waited for boats to come to their rescue. The old and the crippled found the situation doubly difficult.

Into this setting and the days of cleanup that followed came the American Red Cross, the Salvation Army, the National Guard, State government officials, special police, local church groups, and the Mennonite Disaster Service.

The Mennonite Disaster Service is a volunteer person-to-person type of organization that began in nearby Hesston in 1950 and has since spread throughout the United States. A contact man in every Mennonite church congregation has a list of volunteers, including nurses, and a list of available tools and rescue equipment. In Kansas, about 85 congregations can respond immediately to the cry of alarm that follows a major flood, fire, tornado, or earthquake. In the Newton disaster, 600 volunteers responded, bringing their own handtools with them.

Where does it come from?

At the height of Newton's relief and cleanup operations, MDS Director Hostetler drove to the office of Bert Green, SCS soil conservationist assisting the Harvey County Soil Conservation District.

"Bert, where in the world is all this water and mud coming from?" Hostetler asked.

Green explained that all the water that poured down on Newton came from land in the upper part of the 65,000-acre Sand Creek watershed in Harvey and Marion counties. The mud that covered floors, rugs, furniture, and parking lots was mainly topsoil from the farms of the upper part of the watershed—farms operated chiefly by the same Mennonite men and boys who at that very moment

Volunteers help evacuate residents of Newton during the flood of 1965.

were helping to scoop the mud out of flooded Newton homes.

So that's the way it came—the moment of truth. That is what sparked the buildup of conservation interest and a meeting at the Tabor Church several months later.

"I had a slide talk already prepared on soil and water conservation," said Hostetler, a leading conservationist in his own community. "I had been using it with the folks in the Monitor watershed up in McPherson County. We had managed to get 80 percent of the needed conservation treatment on the land there and it gave us hopes we might do as well down here."

In addition to the Tabor men, members of the congregation of the nearby Alexanderwahl and the Goessel Mennonite churches came to see and hear the presentation.

The church meeting is now history, but it lives in the memory of those who came. Galen Rudiger, Newton, secretary-treasurer of MDS, says, "We've sown a lot of seed for thought. It will sprout and grow."

The young Reverend Waltner, who sees that Soil Stewardship Sunday is annually observed in the church program, says, "I look on this as a very crucial meeting in changing attitudes toward soil and water conservation. It was an opportunity for the congregation to see the direct connection between the need for conservation and the flood damage in Newton. The climate has changed so that men can talk with one another about the need for conservation without appearing to threaten their independence. Several men signed up for soil conservation district cooperation last year who hadn't got around to it before."

Conservationist Bert Green can vouch that there has been a great increase in district agreements and conservation work in the watershed above Newton since the 1965 flood. He estimates that more than 20 percent of the needed land treatment has now been accomplished, with up to 30 percent in some of the crucial areas.

Even before the flood, there were some outstanding conservationists in the close-knit Mennonite community. Much of their work was done in an independent fashion using their own equipment.

The Bill Voth family was one of the early conservation farmers of the Sand Creek watershed. Soil Conservationist Bert Green (right) discusses their conservation plan with Mr. and Mrs. Voth and their two sons, Myron (left) and Warren.

Bill Voth, a conservation farmer, has the respect and admiration of his neighbors. Ernest Goertz had built 2½ miles of terraces with his own tractor and dozer blade. He is highly pleased with the way he eliminated ditches, nearly stopped erosion, and increased his income. He points out that he still has more conservation work to do.

To appreciate the progress that is now being made and the real courage it has taken to adopt modern conservation methods, it is necessary to know something of the Mennonites' history and background.

Independence and cooperation

Beginning about 1874, hundreds of Mennonite immigrants settled in central Kansas. They came to America from Russia and brought with them a hard winter wheat that has since helped to make Kansas the breadbasket of the world.

According to Reverend Waltner, the Harvey County settlers established a village pattern. The families were large and customs of inheritance divided the land into many small tracts. Soil and water problems don't respect farm boundaries, however, so decisions on water management require agreement of several landowners before anything can be done. Traditional independence of thought and action, while admirable in most circumstances, had slowed the conservation progress needed to compensate for changes in the use of land.

No one is expecting miracles. Any conservation effort takes time, money, and patience. But persistence is one trait that has never been found wanting in the Mennonites.

In the long run, Sand Creek watershed district leaders now hope to get sufficient control of the waters that fall within the watershed to avoid severe flooding except in the exceptional storm that might be expected once in 100 years. ♦

Drainage improvements extend a school playground

By Frederick T. Mott
Work unit conservationist, SCS, Dover, Del.

How do you extend a school playground over a ditch that passes through a highway culvert and drains five other properties? Federal, State, and local cooperation made a little problem out of a big one for Hartly, Del., population 200.

The public school had been enlarged, and the only space available for more playground area was a poorly drained field. Through this now important section of school property ran the shallow ditch in question. It was a drainage outlet for over half of the 75-acre Erich Lasch farm.

The same ditch passed between house lots, went under a busy public highway, and continued through two more farms.

Until the time of the school expansion, everyone's drainage was satisfactory. The expansion program was about to change all that. That school could not permit an open ditch to run across the playground. Lasch and the other landowners could not afford to have the outlet ditch filled. If an underground pipe were used, the culvert under the highway was too high to take the water.

Most of the landowners involved, as well as some of the school board members, were cooperators of the Kent Soil and Water Conservation District.

Edgar Harmon, a local merchant and chairman of the school building committee, led the people in working together on the problem. The Soil Conservation Service made preliminary investigations, gathered data, and developed a water-control plan.

The plan included an outlet for the Lasch farm, 448 feet of 24-inch diameter pipe under the school playground and house lots, two drop inlets to take the water off the playground, and another to drain the house lots.

Hartly school children enjoy their enlarged playground.

It also called for grading an acre of land, building one drop inlet for highway and village drainage water, enlarging and lowering 78 feet of culvert under the public road, and an additional 3,000 feet of ditch below the highway to improve the outlet through the farms downstream.

The local people approved the plan and made financial arrangements to complete it. The school board put out invitations to bid. The supervisors of the conservation district requested the Delaware Soil and Water Conservation Commission to lower the highway culvert according to the plan. In Delaware, the State Soil and Water Conservation Commission has special authority, funds, and equipment to replace highway culverts or bridges involved with a drainage ditch designed by the Soil Conservation Service. This construction is done as a public service without cost to the properties involved.

Upon receiving the group's permission to begin construction, the district supervisors provided the coordination needed to get the job done. They provided Soil Conservation Service technical services to stake out the job, set grades, and check construction. They also provided their heavy earthmoving equipment for the construction of the outlet ditch. The Soil and Water Conservation Commission did the culvert work under the highway. A local contractor laid the pipe under the playground and house lots and built the required drop inlet structures, including the outlet for the Lasch farm.

Today, the scars of construction have healed and all who took part are satisfied with the results. The surrounding area looks better than it did. All properties are most useful and valuable. The school is enlarged and the playground is excellent. ♦

The plan holds water, but will the dam? . . .

Geologic studies help assure safe watershed structures

By Gunnar Brune
Engineering geologist, Engineering and Watershed Planning Unit, SCS, Fort Worth, Tex.

Building the large dams in watershed projects requires a more thorough site investigation and more exacting design than the numerous small ponds that were a major part of SCS engineering work a few years ago.

Some of the multipurpose structures in watershed projects are more than a hundred feet high and may impound up to 25,000 acre-feet of water. Such structures are too costly to be undertaken without assurance that they will function properly. More important, the failure of such a large dam might endanger lives and certainly would cause severe damage to property.

Detailed exploration of subsurface geology is a necessary part of site investigation for large dams. A few shallow borings with a hand auger usually provided sufficient information for the design of farm ponds, but deep borings with power machinery and sophisticated testing of rock and soil are required for the larger structures.

The Soil Conservation Service uses professional geologists, skilled field crews, and laboratory facilities to determine the nature of foundation materials, the types and amounts of soil and rock material available for construction, whether rock excavation is required, and to answer other problems relating to each damsite.

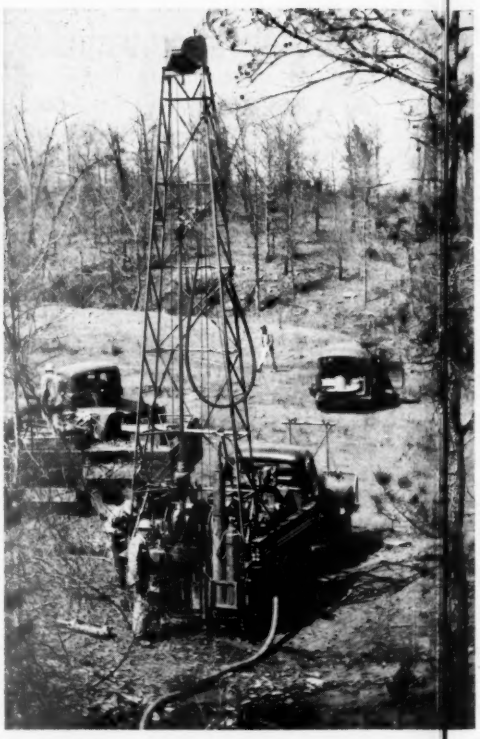
An SCS drilling party normally consists of two geologists, two drillers, and three helpers. Each party usually has a large core drill rig capable of taking rock cores or undisturbed soil samples, a power auger to investigate potential borrow areas, a water truck to supply water for coring operations, a mobile field office or trailer, and other vehicles. In those States that have little geologic exploration to do, a private contractor usually is hired to do the drilling.

After the geologic data on a site have been gathered, the geologist must prepare a report of his findings. His work may indicate that montmorillonitic clays, subject to serious swell-shrink tendencies, are present. He may find different thicknesses of compressible material or an uneven rock profile that might cause differential settlement of a dam. The availability of various types of soil and rock material must be described in the geologist's report.

Some types of rock in a foundation can cause serious problems. Anhydrite, for example, can explode violently when water is impounded over it.

Caverns in the proposed foundation site must be outlined, for they could cause a structure to leak or collapse. Faults, where geologic formations have cracked and moved in relation to one another, must be studied, for they might result in serious leakage or settlement problems after a structure is built. A thorough evaluation of potential slide areas must be given in the final report.

To obtain the necessary geologic information, drilling may be supplemented or supplanted by trenches dug with a bulldozer, especially in bouldery or cobbly soils.



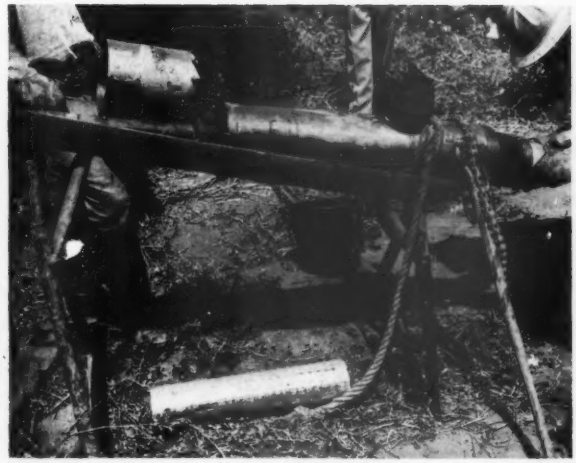
An SCS drilling party (above) sets up a core drilling rig on the centerline of a proposed damsite. Much of the work on most sites is done with a simple earth auger, with the geologist describing and logging the materials as they are removed from the hole. Disturbed samples are taken for testing in the laboratory.

Many special geologic tests are made in the field. A seismograph may be used to determine the depth to bedrock. A resistivity meter uses electricity to give information about underground formations and the water table.

Where it is impossible to obtain an undisturbed soil sample, the field party may use special equipment to determine the in-place density of materials.

Vane shear test equipment is used to measure the in-place shear strength of soils. The results of such tests are especially valuable for "sensitive" clays that are difficult to sample in an undisturbed condition for laboratory tests.

A Wheatstone bridge, an electrical device, may be used to tell whether there is a dangerous



For some types of tests, such as consolidation potential, undisturbed soil samples are required. The most common method of obtaining these is with a double-tube sampler (above, left). The outer tube of this device rotates and cuts away the soil with a toothed bit while the inner tube is forced down over the sample without turning. A drilling fluid carries the cuttings out of the space between the two tubes and to the surface. In dry soils, the addition of water would destroy the structure of the soil, so air is used to blow the cuttings to the surface. Penetration tests are made with a special type of sampler (above, right) and a standard drive weight that is dropped a standard distance. The number of blows required to drive the sampler 1 foot provides information on the strength of the foundation. Permeability tests are made in the field with a permeameter (below). This apparatus measures the rate of movement of water through various subsurface strata. The equipment can be used to simulate the head of water that will exist when the proposed structure is built and thus indicate whether serious leakage would occur.

Cores of rock often are needed for inspection or testing. Steel bits surfaced with hard alloys or industrial diamonds are used to obtain such cores, which can then be laid out in sequence and described.

amount of gypsum in the foundation or in the materials to be used to build a dam.

Piezometers may be installed to measure ground-water pressure and aid in studying ground-water flow. Ground-water samples are tested where it is suspected that the water may cause corrosion or incrustation of concrete and steel structures.

Geologic exploration is needed for channel improvement projects as well as for dams. The presence of rock, weak caving materials, or very permeable soils in proposed channels, must be detected and avoided if possible.

Basic information on these and many other geologic phenomena that may have a bearing on the design of a dam or other structure is then presented in a form useful to design, construction, and soil mechanics personnel. ♦

Watershed project keeps Texas town safe from Hurricane Beulah's floodwaters

Hurricane Beulah in September 1967 proved to the people of Bishop, Tex., that upstream watershed projects really work.

While most south Texas cities fought floodwaters for days during and after the hurricane, Bishop escaped with only a few hours of light flooding, thanks to a 3½-mile levee and channel flood-prevention system installed as part of the Chiltipin-San Fernando Creek Watershed Project.

Flooding occurred only twice during the torrential rains associated with Beulah September 19–22, and then only for a few hours at a time. This was in contrast to previous storms when Bishop was hard hit by flooding.

In 1958, most of the town was under water for 3 days. In 1967, water overtopped the levee twice, covering only the western section of town for 6 hours one time and 9 hours the other. Residents and businesses in the eastern part of the city, however, were high and dry throughout the storm.

Bishop Mayor J. H. West praised the watershed project, saying that Bishop would have been washed away had it not been for the levee and channel system. He estimated that the project saved at least $500,000 in damages to the city.

West also said flooding in other sections of south Texas was worse than in 1926, the previous record flood. He said that the city of Bishop got back more than the cost of the project through this one test. This is considered the first major test since the project's completion.

Rains following Beulah exceeded what might be expected on the average once in 100 years. Before the storm hit, Bishop had already had 14 inches of rain, and the soil was so soaked that it couldn't hold any more water. Some areas in the watershed had 22 inches during the storm—almost equal the 25 inches that is normal for a year. In addition high winds retarded runoff until the storm passed, causing more water to come downstream at one time. The result was more water than the protective system was designed to handle.

Interest in the watershed project started in 1954 following floods in 1951 and 1953. A watershed association was formed to help the Nueces-Jim Wells-Kleberg and Aqua Poquita soil and water conservation districts get the project underway.

Under the leadership of John Young, then Nueces County judge and now a Congressman, local interests raised $90,000 to pay for planning the project. Nueces County raised 50 percent of the funds, Jim Wells County 30 percent, and Duval County 20 percent, a ratio based on estimates of benefits from the project and used also in computing right-of-way and maintenance costs.

In addition to the 3.5-mile levee and channel project protecting Bishop, the Chiltipin-San Fernando Creek Project calls for 11 flood-retarding dams, 20.35 miles of channel improvement, and 5.7 miles of levee designed to give flood protection to other downstream areas in the project.

Although some flooding did occur in Bishop, officials are pleased with the way the project worked and that the community escaped the high waters it otherwise would have had.—REUBEN A. FRANKENHAUSER, *soil conservationist, SCS, Robstown, Tex.* ♦

State governments increase funds for districts

State Government contributions to soil conservation district programs increased to $24.9 million in fiscal year 1967 from $21.1 million in 1966. All State governments appropriated or allocated funds to district programs in 1967. These contributions have almost doubled in the last 5 years.

In all, non-Federal contributions of funds and services to conservation districts are estimated to be $81.5 million in 1967. This includes the contributions of State and local government and those of private individuals and organizations.

Contributions from local governments increased to $26.9 million in 1967 from $19.6 million in 1966. Contributions of local government have increased $10 million since 1963.

Contributions from private individuals and organizations increased to $29.6 million in 1967 from $23.4 million in 1966. ♦

Conservation aids in conversion to golf course

Mr. and Mrs. David E. Maxson had reached the point of decision. They couldn't continue operating their dairy farm any longer.

Income was too marginal in a highly competitive area. Their family farm of 70 acres and 30 cows was just too small. Expansion was out of the question, for owners of adjoining land had no intention of selling, even at $1,000 an acre for uncleared acreage. This was premium land, being only a 5-minute drive from Amherst, famous college and university town in Massachusetts.

The Maxsons were unwilling to give up the place they loved. So they turned the farm into a 9-hole, 37-par golf course.

They sold their cows and went to work on the changeover. It took a lot of toil converting to golf. But finally they opened their Cherry Hill Golf Course on August 13, 1965. Their biggest single day during the rest of the short 1965 season saw 130 golfers at play over the rolling course. Their biggest weekend brought out 200 players.

When Maxson began the conversion, he found that the conservation program he had applied to his farm served the needs of the golf course well.

His conservation farm plan included irrigation, four ponds, drainage, grassed waterways, and crop and pasture rotation. He fertilized and limed the land as soil tests dictated. As a cooperator with the Hampshire Conservation District, he received technical help from the Soil Conservation Service in planning and applying his conservation program.

Now one of the farm ponds supplies all the water needed for keeping the fairways and greens of the golf course in top condition. The ponds also serve as golfing hazards.

The $3,000 he invested in the conservation work on his farm multiplied in value when he converted the dairy to a golf course, he said. But changing the use of the land took a lot of additional money—$100,000.

Owner David E. Maxson watches as friend and neighbor Ralph Hobart gets ready to tee off at the first hole of the newly constructed Cherry Hill Golf Course.

Maxson has remodeled a barn to house a lounge, restaurant, toilets, and shower and locker rooms. These facilities are on the ground floor, a few steps from the first tee and ninth green. The second floor houses a pro shop.

For patronage the Cherry Hill Golf Course draws on the people of Amherst and dozens of nearby towns, the faculty and students of the ever-expanding University of Massachusetts, and tourists who like to play golf wherever they happen to be. There's no other golf course for miles around, except one at Amherst College that is operated on a membership basis with nonmembers being permitted to play only when there is room to accommodate them.

Aside from a professional golfer who runs the pro shop and arranges for tournaments and other special events, the operation remains a family affair. Maxson takes care of the physical layout, keeping the course in first-class condition. Mrs. Maxson and the five children also help. ♦

Father and son make a conservation team

Conservation may not be an hereditary trait, but Randy Patefield, 17, and his father Warren, of Laurel, Nebr., prove it can be passed on from generation to generation.

Warren is the newly elected president of the Nebraska Association of Soil and Water Conservation Districts.

Randy is a 4-H'er who won 1967 State honors for his conservation efforts. He also won an expense paid trip to the 46th National 4-H Club Congress in Chicago, courtesy of John Deere, sponsor for the 4-H Conservation of Natural Resources program. ♦

Strip mine makes a recreation area

A 6½-acre lake created in a strip-mine pit is a center for pleasant living for the Bauemeister family. On one side of the lake are their cottage and boat dock, on the other a duck blind.

An attractive recreation area was what Roger Bauemeister had pictured when he bought 42 acres of strip-mined land in 1953. Only five areas had not been damaged by stripping and deposition of spoils.

Today, from the front porch of their cabin and boat dock, the Bauemeisters enjoy the beauty of their own 6½-acre lake in Callaway County, Mo. Rabbits thrive in the shrubs and grass that have been planted over the years.

As cooperators with the Callaway Soil and Water Conservation District, the Bauemeisters had the assistance of the Soil Conservation Service, the Forest Service, and the State Department of Conservation in the creation of an attractive recreation area. Trees and shrubs were furnished through the Agricultural Conservation Program.

Each spring since 1954, Mr. Bauemeister has planted evergreens until today they number about 40,000. A multiflora rose fence, started from 11,000 seedlings, surrounds the entire area.

Two hundred fifty European black alders were planted in 1963. About 50 percent have survived and grown to heights of up to 18 feet. A few oaks have also been planted.

Lespedeza sericea, shrub lespedeza, switchgrass, and kudzu have responded well in most areas. Kudzu was first planted in 1963 to cover unsightly steep spoil banks. Results were excellent for bank stabilization but kudzu proved undesirable if used where it could get into trees or shrubs.

The lake, beside which the Bauemeisters built their cabin in 1956, was created by the last stripping operation. Bauemeister arranged for runoff water to drain into the lake, thereby diluting the acidity.

The Bauemeisters and many of their friends use the area for recreation, including hunting. ♦

Television features soil stewardship

"Top O' the Morning," Orion Samuelson's television show brings the soil stewardship message to 35,000 Chicago-land viewers each May.

Samuelson, farm director of station WGN in Chicago, will highlight this year's stewardship theme, "A Time for Initiative," with five special conservation programs during Soil Stewardship Week, May 19–26.

Directors from three soil and water conservation districts in northeastern Illinois and from a district in Indiana will feature their conservation activities on four of these shows.

For the fifth, Mr. Samuelson plans to show colored slides of a dozen or more rural churches within WGN's viewing area (which includes parts of Ill., Ind., Wis., and Mich.) and tell of the conservation practices used by members of each of these churches.

"I consider soil and water conservation the most important task in which rural and urban people need to cooperate," said Samuelson. "As land is developed for new uses, it is imperative that the natural resources—particularly soil and water—of an area be considered. From the conservation activities we have highlighted on WGN, I have learned that soils information and interpretations are a very important tool in planning the wise use of land."

During the 1967 Soil Stewardship Week, Emil Kubalek, Soil Conservation Service soil conservationist, Lake Zurich, and Harold Alvin, district director of the Lake County District, presented a program illustrating the conservation plan and practices applied on Burr Oak Nursery, a cooperator with the Lake County District. Alvin, who operates the nursery, installed terraces and waterways, and planted young trees on the contour.

Allan May, SCS work unit conservationist at Joliet, and William Stelter, district director of the Will-South Cook District, gave a program in 1967 that emphasized the role of private land owners in conservation of natural resources.

A third feature presented by Lawrence Benson, SCS work unit conservationist at Geneva, and Richard Kuhn, district director of Kane-DuPage District, discussed the role of the private land owner in providing recreation. Colored slides of small ponds installed in the Kane-DuPage District illustrated the fishing, swimming, ice skating, and picnic uses of the ponds and the adjacent areas.

In addition to its soil stewardship programs, WGN has also made much use of the color conservation scenes from the "America The Beautiful" series. The Lake County District presented a set of the 52 pictures to WGN several years ago. At that time Harold Turner showed all 52 pictures while he played organ music for a special WGN Thanksgiving program. Since then both Samuelson and Turner have frequently used the pictures on their programs.

Samuelson's future plans are to devote one "Top O' the Morning" program each month to soil and water conservation in addition to the soil stewardship programs.—RICHARD DUESTERHAUS, *work unit conservationist, SCS, Lake Zurich, Ill.* ♦

New electrification loans

More than 3,450 new consumers in Arizona, Colorado, Idaho, Missouri, Virginia, Texas, Montana, and West Virginia will benefit from loans recently approved by Rural Electrification Administration. Loans totaling $10,533,000 will enable the borrowers to finance 341 miles distribution line, 153 miles transmission line, 11 substations, and other related facilities, to connect the consumers and to meet increasing electric power needs of people already being served. ♦

Cornell students study tropical soils

Luis H. Rivera, staff soil scientist, SCS, explains the classification and soil properties of a typical Ultisol on the Corozal Agricultural Experiment Substation.

A group of 30 students from Cornell University, most of them doing graduate work and with a major interest in tropical agriculture, visited Puerto Rico in January.

The trip was a joint effort of Cornell's International Agricultural Program and the University of Puerto Rico's Mayagüez Campus.

The group was interested in three main subjects: tropical crops, tropical animal science, and soils. Among the students were three girls, and also students from Africa, South Vietnam, Philippines, Canada, British Honduras, India, and Nicaragua.

Highlights of the trip were visits to several experiment stations and private farms to observe research and field operations in soil and water conservation practices, crops, grasses, and livestock. The students also visited a sugar mill to become acquainted with its operation.

The Soil Conservation Service provided training to the soils group under the leadership of Staff Soil Scientist Luis H. Rivera. At each selected site, the classification, soil characteristics, and available laboratory data were discussed. A special effort was made to show the soils that are extensive in tropical areas, such as the Vertisols, Ultisols, and Oxisols.—EMERITO MARTINEZ-RUIZ, *SCS, Santurce, Puerto Rico.* ♦

RUSSIA'S CODE

Russia is preparing its first detailed national code to regulate water use throughout the USSR. Each Soviet republic and province is also drawing up a local code in which specific aspects of water use in different areas will be taken into account. ♦

Conservation pioneers in Paraguay

By Leon Kimberlin
Conservation agronomist, SCS, Phoenix, Ariz.

Santiago Benitez is a pioneer. To visit with him on his farm is to gain appreciation and respect for the industrious efforts, the problems, and the aspirations of settlers in eastern Paraguay.

Benitez is tremendously proud of the 50-acre farm which he and his family are developing in this subtropical region. Pride is evident in his eagerness to show the results of his labors in clearing the forest and planting his fields. He is proud to display his recently acquired team of oxen and his new plow. And, he is proud of his role in the agricultural development of his country.

Benitez and his family are among the more than 35,000 families who have located in new farming areas during the past 6 years as part of the Paraguayan Government's effort to more fully develop the Nation's agricultural resources.

As conservation adviser

In Paraguay, as a soil conservation adviser during the summer of 1966, I had the privilege of working with Paraguayan officials and technicians of the Institute of Rural Welfare, the College of Agronomy, Extension Service, Agricultural Experiment Station, and others in helping these dedicated people search for practical solutions to their conservation problems. My work in Paraguay was sponsored jcintly by the U.S. Department of Agriculture and the U.S. Agency for International Development.

Paraguay, compared with most other countries of the world, has much arable land in relation to its population. The climate and soils favor production of a variety of crops, and accelerated production is an important goal in Paraguay's economic development plans.

Torrential rains, erodible soils, clear-cutting of forests, and rapid losses of organic matter and soil fertility under clean cultivation contribute to the need for soil conservation in the new farming areas. The Institute of Rural Welfare, the agency of the Government of Paraguay administering the program, recognizes this need and is providing for conservation in its plans for agricultural development.

With machete and oxen

Agriculture in Paraguay is not highly mechanized. Of the 161,000 farm units reporting in the 1961 census, more than a third were using human energy for farm power. Only 1,221 tractors were reported. The remaining units used oxen or horses.

The new settler attacks the jungle-like forest with machete and ax. He fells trees and burns the brush and smaller logs to clear a patch of land for his home and for subsistence crops, which he plants and cultivates with a hoe.

After establishing crops for family food, he continues clearing land as rapidly as he can in order to extend his production beyond a subsistence level. In 3 to 4 years he can clear up to 10 acres of his 50-acre farm. At this point the labor of planting, cultivating, and controlling jungle regrowth on land already cleared prevents further expansion.

When he has reached this point, he may purchase a yoke of oxen and a plow, thereby diverting hand labor for clearing additional land. He has moved beyond the subsistence level of farming, and his farm unit is producing economically useful crops.

Conservation demonstrations

The Institute of Rural Welfare focused attention on soil conservation in the developing areas during 1966. The institute received the full cooperation of other Paraguayan agencies, including the College of Agronomy, Extension Service, and the Agricultural Experiment Station, in training technicians, reviewing field problems, setting up demonstration areas, and developing policy and procedures for soil conservation activities.

Existing soil surveys were interpreted, and technical guidelines for land use and conservation treatment were prepared. Guidelines include land use and treatment alternatives applicable to the different levels of management and technology.

A short course in theory and practice of soil conservation was conducted for field technicians of the Institute of Rural Welfare and the Extension Service. The first of its kind in Paraguay, preparation for and conduct of this course drew the enthusiastic support of all agricultural agencies.

Four demonstration farms in different parts of the country were selected to represent the major conservation problems in each locality. A conservation plan was made with each of the farmers to put into effect a practical demonstration of the kinds of practices most applicable in the area.

Santiago Benitez seemed to voice the sentiments of his neighbors as he helped technicians lay out a soil conservation demonstration on his farm. "I want to live on this farm all my life," said Benitez, "I want it to be a good farm!" ♦

POND SEEPAGE

Excessive seepage in farm ponds is usually due to soils in the pond site that are too permeable to hold water. Thorough site investigation in the planning stage usually spots problem pond sites and allows landowners to avoid them. ♦

Meetings . . .

Garden Club Council talks of conservation

National Council of State Garden Clubs, Inc., will hold its 39th annual meeting in Biloxi, Miss., April 1–5.

The National Council, with a membership of more than 400,000 women, carries on an extensive program of activities through the several thousand local clubs affiliated with National Council as members of their State organizations.

For the convention theme, the council chose an old Spanish proverb, "More Grows in the Garden Than the Gardener Sows." The national president is Mrs. Charles O. Dean of Leland, Miss., who was a featured speaker at the annual NACD conference in Dallas, Tex., in February.

A symposium on conservation is planned for the program, and there will be reports of achievements in civic development, high school gardener projects, roadside development, and natural beauty projects, which are part of on-going programs in garden clubs throughout the country.

Dates and places

April 1–5, National Council of State Garden Clubs, Biloxi, Miss.

29–May 3, League of Women Voters, Chicago, Ill.

May

1–2, Southern Forestry Conference, Jacksonville, Fla.

4–9, American Society of Planning Officials, San Francisco, Calif.

13–17, Environmental Engineering Conference, Chattanooga, Tenn.

14–17, The Garden Club of America, Greenwich, Conn.

19–25, Soil Stewardship Week

26–29, National Watershed Congress, New Orleans, La.

26–30, Urban Land Institute, Atlanta, Ga.

John Williams (left) and SCS Soil Conservationist H. J. Hardy are pleased with the fish pond's contribution to farm income and recreation.

Diversification and new ideas improve land

By diversifying his operations, adopting new ideas, and carrying out a conservation plan, John Williams of Route 2, Salley, S. C., has improved his Aiken County farms.

Williams was one of the first cooperators with the old Edisto Soil Conservation District in 1939 and continued when the Aiken County Soil and Water Conservation District was formed in 1942, the same year that Howard J. Hardy joined SCS at Aiken.

Mr. Williams gave Hardy credit for helping him revise his first conservation farm plan. In carrying out the plan, Williams converted cotton and corn land to pastures. He built parallel terraces and grassed waterways. He stripcropped and planted and culled hardwoods. He built a 3-acre pond, stocking it with bass, bream, and catfish. People came from miles around to fish for $1 a day.

"That extra income from the fish pond helped," said Williams. "Besides, the pond provides water for my cattle." He will soon build another fish pond.

"Wind erosion used to be a real problem," said Williams. "The planting of multiflora rose and pine trees has about solved it, though."

Williams added to his original 97 acres by buying an adjoining 75 acres on which he developed pastures for Herefords and a few Jerseys. His herd of 18 head is now grazing on bermudagrass, bahiagrass, and sericea. He sold $1,000 worth of cattle last year. He also grows cotton, corn, wheat, oats, soybeans, velvet beans, and rye.

In the early days with only a few mules, he and his family did the work by hand. Today, he operates combines, haybalers, and tractors on his two farms and 65 acres of rented land.—MURRAY WOOD, *RC&D project coordinator, SCS, Walterboro, S. C.* ♦

Review

Selected Papers in Soil Formation and Classification. EDITED BY J. V. DREW. *1967. Soil Sci. Soc. Amer. Spec. Publ. 1. Madison, Wis. 428 pp., illus.; paper. $3.00.*

This collection of papers on modern concepts in soil formation and classification should prove useful to soil scientists and others as a reference book. It brings together a wide range of material previously published in a variety of places. The editorial staff has done a good job of selecting important papers and grouping them under five broad headings.

The introductory section provides some general ideas on weathering, translocation, and the organic cycle in soil formation, and the possible relationships of these to environmental factors. The second section consists of 14 papers on characteristics of some genetic soil groups. A third section contains eight papers on soil forming factors, and the fourth deals with some important mechanisms and changes involved in soil genesis. The final section contains four papers on some modern concepts in soil classification.—LOUIS E. DERR, *Soil Survey Operations Division, SCS, Washington, D. C.*

The Wild Gardener in the Wild Landscape. BY WARREN G. KENFIELD. *1966. Hafner Publishing Co., New York. 232 pages, illus. $7.50.*

Early in this book the author identifies the audience that he is addressing: "This book is meant for those to whom fate or fortune —or misfortune—has given a tract of land of greater size than their lawn-mowing propensities can control."

He goes on to explain that the kind of land involved is usually abandoned fields growing up to a mass of vegetation, mostly impassable brush, blocking the view and generally interfering with the landscape desires of the owner.

The solution that he offers is "naturalistic landscaping," manipulating plants and plant communities to form a pleasing whole. The methods he advocates are the application of herbicides with fertilizing, cutting, pulling, burning, and planting used to lesser degrees.

In three chapters the author provides detailed instructions for obtaining naturalistic landscaping. The first of these is concerned with eliminating plants; the second with maintaining the landscape; and the third with adding and aiding plants.

The principles as well as the methods of molding and managing vegetation stated in this book have applications beyond the requirements and esthetics of landscaping. Biologists, range conservationists, park planners, and others who wish to establish and maintain a particular plant community will find these ideas provocative and helpful.—LAWRENCE V. COMPTON, *head biologist, SCS, Washington, D. C.*

Man—An Endangered Species? BY U. S. DEPARTMENT OF THE INTERIOR. *1968. U.S.D.I. Conservation Yearbook No. 4. 100 pp., illus. $1.50.*

Continuing the format and the thesis of the lavishly illustrated Conservation Yearbooks begun in 1965, the Department of the Interior again presents its annual report of agency activities in the context of a crusade for conservation.

The brief introductory essay is an eloquent statement of the problem of environmental pollution and a plea for restraint in population growth and technological advancement. Otherwise, we are warned, man may join the ranks of the "endangered species"—if he has not already done so.

This is a restatement of the theme of "Quest for Quality," "The Third Wave," and "The Population Explosion," the titles of the preceding yearbooks.

Handsome color photographs, made possible through the loan of color separations of previously printed pictures in government and commercial publications, set an entrancing and appropriate background for the text.

The book is for sale by the Superintendent of Documents.—B.O.

Agricultural Development and Economic Growth. EDITED BY HERMAN M. SOUTHWORTH AND BRUCE M. JOHNSON. *1967. Cornell University Press, Ithaca, N. Y. 608 pp., map. $12.00.*

This book is intended primarily for students of the economics of agricultural development, both those in preparatory training and those more mature scholars who are already practitioners or interested in entering this challenging field. Although the book is written in the language of economics, its ideas are intelligible to interested readers not versed in the higher realms of economic theory.

The book is made up of a series of 14 chapters by well known authorities each followed by rather extensive comments by one or more commentators. Extensive citations and references are given at the end of each chapter.

An introductory chapter by the editors, entitled "Agricultural Development: Problems and Issues," sets the stage for the rest of the book by describing problems and issues and the role of the economist in agricultural development.

The 12 succeeding chapters contain a wealth of information and theories on a wide range of subjects. The final chapter by E. M. Ojala sets forth some ideas on how development should be planned and programed. Lacking, however, is any summary tying all of the papers together into some kind of conclusion or evaluation as to where we are, where we should be going, and how to get there in agricultural development.—JOSEPH B. ROGERS, *assistant for foreign programs, SCS, Washington, D. C.*

New publications

Soil Survey Laboratory Methods and Procedures for Collecting Soil Samples. By Soil Conservation Service. *1967. USDA Soil Survey Invest. Rpt. 1. 50 pp., illus. $0.35.* This publication is the first of a new USDA series, Soil Survey Investigation Reports, established to make available technical information from cooperative laboratory and field investigations of soils of the United States, Puerto Rico, and the Virgin Islands.

This, the first number in the series, describes the various tests performed and procedures used in the soil survey laboratories. Succeeding numbers will publish the data obtained from samples from each State, tabulated by named kinds of soil. To date, 17 State reports have been published (N. Dak.; Iowa; Kans.; Nebr.; Ark.; Mont.; Wyo.; Minn.; Colo.; Okla.; Puerto Rico; Miss.; Ky.; Tenn.; N.C., S.C., and Ga. in one report; Wis.; Ind.).

A Method for Estimating Volume and Rate of Runoff in Small Watersheds. By K. M. Kent. *1968. USDA SCS–TP–149. 19 pp., illus.*

This technical paper presents a simplified method of estimating runoff in small watersheds that can be used by all grades of professional and subprofessional personnel of SCS work unit staffs who need to make quick, on-the-spot estimates for planning and designing conservation measures.

Charts are presented for estimating the instantaneous peak discharge expected from small areas. Each graph relates peak discharge to drainage area and rainfall depths for each of (1) a given set of watershed characteristics, (2) different rainfall time distributions, and (3) three categories of average watershed slopes.

The method is generally limited to drainage areas of 2,000 acres or less and to watersheds that have average slopes of less than 30 percent. The simplified method is compatible with the more complex procedures of the National Engineering Handbook which would be used on more difficult problems.

Aspirations and Expectations of the Rural Poor. By Walter L. Slocum. *1967. USDA Agr. Econ. Rpt. 122. 37 pp.* One of several studies made to provide research approaches in different problem areas of rural poverty and economic development. This report was prepared by the author under contract authorized by the Economic Research Service but his opinions do not necessarily reflect the view of the agency nor USDA.

A Comparison of Age Levels of Farmers and Other Self-Employed Persons. By Radoje Nikolitch. *1967. USDA Agr. Econ. Rpt. 126. 13 pp., illus.* Farming industry continues to expand its production, and farmers as a group are not getting older than entrepreneurs in other industries.

Conservation and the Water Cycle. By Soil Conservation Service. *1967. USDA Agr. Inf. Bull. 326. 8-page folder, illus. $0.10.* The water cycle is an endless process of water circulation going on throughout the world. The colored diagram in the folder and the description of the hydrologic processes that affect the earth and its inhabitant trace the movement of water through the cycle. A 40- x 28-inch color reproduction of the diagram is for sale by the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402 for $0.35.

Sealing Leaking Ponds and Reservoirs. By George Renfro, Jr. 1968. *USDA SCS-TP-150. 6 pp., illus.* Excessive seepage in farm ponds is usually due to soils in the pond site that are too permeable to hold water. Several methods of sealing leaking ponds are recommended in this paper. The least expensive is by compaction. Sites with too little clay to prevent excessive seepage can be sealed by an earth blanket if there is a suitable borrow area close enough to permit hauling at a reasonable cost. Sealing with bentonite; treatment with chemical additives; sealing with flexible membranes such as polyethylene, vinyl, and butyl-rubber membranes; lining with portland cement; and paving with asphalt are other methods.

Measuring the Effect of Irrigation on Rate of Technological Change. By James A. Burns. *1967. USDA Agr. Econ. Rpt. 125. 23 pp., illus.* Compares irrigated with nonirrigated farms in the High Plains of Texas, and irrigated dry-area farms in the San Joaquin Valley with nonirrigated humid area farms in the Mississippi Delta.

Growing Summer Cover Crops. By Crops Research Division, Agricultural Research Service. *Rev. 1967. USDA Farmers' Bull. 2182. 16 pp., illus. $0.10.* Superseding Farmers' Bulletin 1750 on the same subject, discusses cultural practices and 14 crops commonly used.

Soil surveys

Kay County, Oklahoma. By James R. Culver. *1967. 86 pp., illus. maps 3.17 inches to the mile (1:20,000).* Fieldwork by James R. Culver, William R. Bain, and Beryl G. Baggett.

Indiana County, Pennsylvania. By Jay B. Weaver and Joseph D. Ruffner. *1968. 110 pp., illus.; maps 4 inches to the mile (1:15,840).*

Gray County, Kansas. By Bob I. Tomasu and William E. Roth. *1968. 59 pp., illus.; maps 3.17 inches to the mile (1:20,000).*

Cabezon Area, New Mexico. By James J. Folks and Walter B. Stone. *1968. 44 pp., illus.; maps 2 inches to the mile (1:31,680).*

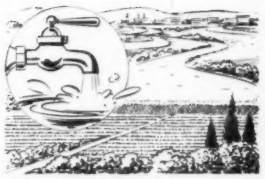
AMERICA THE BEAUTIFUL COLOR LITHOGRAPHS

America The Beautiful—Minnesota USDA SOIL CONSERVATION SERVICE
LAND CONSERVATION AND WATERSHED DAM, FILLMORE SOIL CONSERVATION DISTRICT

Full-color lithograph prints suitable for framing—one for each State, Puerto Rico, and Virgin Islands—are available from the Superintendent of Documents for $0.10 each or $5.00 for set of 52. Obtain order blanks from your local SCS or post office.

From the Administrator:

Planning for Water and Related Resources



We are beginning to see the fruits of more than a decade of river basin investigations carried on under a variety of cooperative arrangements with agencies both inside and outside the Department of Agriculture.

In several locations, comprehensive reports are in the hands of local community leaders and responsible State and Federal officials; in others, information gathered in river basin studies is shaping the thinking of local leaders even before the survey recommendations are put in final form.

The results are evident in the increasing clarity with which local people see their water and related land-resource problems and identify feasible solutions. Watershed project applications and plans from areas where river basin surveys are completed, or nearing completion, better meet the criteria for prompt approval and rapid execution. Such projects emphasize multipurpose plans and are noticeably better coordinated with other related resource and economic developments of the region.

In its statement on *Resources in Action*, the Department stresses the necessity of water and related land-resource developments as essential to the sustained economic growth of the Nation. An adequate supply of good quality water stimulates the economy of local communities. The reduction of water pollution to acceptable levels is essential to this accomplishment.

Upstream watershed projects are an excellent means of providing many of the water-related goods and services needed to sustain the national economy. River basin studies offer excellent opportunities to make the watershed program of SCS and the Department increasingly effective.

During this year we are participating in 52 studies. Ten are "framework" studies and the others are "detailed comprehensive" studies. Let's examine what each type can provide.

Framework studies establish broad guidelines within which water and related land-resource development programs could effectively operate in the public interest. They determine for major water-resource regions what portions of the national needs for economic goods and services could be supplied by each region for the present and for specific periods in the future. They assess the availability of suitable land and water resources for each of these periods, giving consideration to the requirements on the resources to meet other needs. They define and evaluate alternative approaches to meeting the needs and identify sub-basins where more detailed studies are needed to determine which alternative is in the best interest of all the people.

Within this kind of a framework, it can then be determined where upstream watershed projects are the most feasible means of providing watershed protection and flood protection, irrigation, municipal and industrial water supply, water-based recreation, fish and wildlife enhancement, and storage for water-quality management. Also, it can be determined where it is desirable to move slowly until a detailed study has been made.

Comprehensive detailed studies go further and identify projects which have a high priority to be installed within the next 10 to 15 years. In addition, the alternatives are analyzed to determine which are in the best interest of the communities and the regions concerned.

Combinations of upstream and main-stem developments are examined to determine the needed scale and scope of each and to indicate priority of development.

Decisions as to which alternative is selected in each case should be made by the people in the communities affected on the basis of knowledge of the effects each alternative would have on different segments of the community. For example, the cost of benefits foregone by the agricultural segment as a result of flood-plain inundation should be considered fully.

Detailed comprehensive studies enable the Soil Conservation Service to identify interrelationships between potential projects within a sub-basin; to recommend priorities of establishment based on these interrelationships and identified needs; to define the nature and scope of project development needed to assure that present and future needs can be met; to recognize where immediate action is needed to preserve reservoir sites; and to help local people plan ahead to meet their needs.

These studies help also to identify conditions where other types of resource conservation and development projects are needed. They have in some instances stimulated the formation of new soil conservation districts by local people. In many cases they have motivated local sponsors to take immediate action on potential watershed projects; in others they have eliminated the need for preliminary investigations on watersheds that are not potentially feasible projects under present criteria.

River basin plans contain valuable information that should be put to work at all levels of SCS organization in order to accomplish the Department's stated goal of "planning and developing all major river basins on an orderly basis in relation to the needs of all people."

D. A. WILLIAMS

UNITED STATES
GOVERNMENT PRINTING OFFICE
DIVISION OF PUBLIC DOCUMENTS
WASHINGTON, D. C. 20401

OFFICIAL BUSINESS

SC-JAN 46129
UNIV. MICROFILMS
SERIALS SECTION
300 NORTH ZEEB ROAD
ANN ARBOR, MICH 48105

ID FEES PAID
T PRINTING OFFICE

If your address changes, please notify us of your complete new address, including Zip Code number, and include old address with our code number as shown above.

Diversions and tillage reduce erosion for wheat farmers

By George C. Welch
Soil conservationist (dryland specialist), SCS, Pocatello, Idaho

A combination of diversion terraces, chiseling, and stubble mulching brought erosion rates down to a tolerable level on a group of wheat farms in the Side Canyon area of the Rock Creek watershed in the Power Soil Conservation District, Idaho.

The practices were installed by cooperators who were alarmed by what happened to their wheatfields during the heavy rains and floods of December 1964 and a cloudburst in July 1965.

They had seen their hillsides riddled with gullies and some of the watercourses cut down as much as 15 feet. On-the-ground measurements indicated soil losses of more than 100 tons an acre in some fields, and 300 to 400 tons where double summer fallow was practiced.

Through cooperative planning by the district supervisors, the Agricultural Stabilization and Conservation Service County Committee and office manager, the Soil Conservation Service soil conservationist, and the county agent, an ACP "special project" was established to cost-share the needed conservation measures in the dryland wheat area of Power County.

During 1966, the farmers in Side Canyon constructed 33,000 feet of diversion terraces, 27,900 feet of grassed waterways, three debris basins, and two grade and outlet stabilization structures. They planted grass on 21 acres of waterways and diversions and 82 acres of pasture and hayland, and did 2,410 acres of subsoiling.

Two neighbors, Raymond Kress and Jack Richards, filled in their gullies and constructed diversion terraces at intervals four times the spacing for contour stripcropping. Then they contour-chiseled between the diversions to a depth of 10 inches on 2-foot spacing.

The 1967 spring moisture was above normal, and during June and July several intense summer storms occurred. According to farmers in the area, these storms at least equaled the damaging storm of 1965. Again damage was heavy on untreated areas, but where the conservation practices were used, erosion measurements revealed a loss of only 5 to 6 tons of soil an acre.

Although all the needed land treatment is not yet completed, the Side Canyon area is well on its way to establishing a good dryland conservation program. ♦

SCS Work Unit Conservationist Oscar Onstott (below) measures depth and width of a rill while Hugh McKay, superintendent of Tetonia Agricultural Experiment Station, takes notes as basis for estimating soil loss by erosion. Raymond Kress (right, above) and the author observe the first diversion terrace constructed in the Power Soil Conservation District. The stubble still stands on the intervals where chiseling has been done.